

# Unconventional oil and gas seismic exploration technology and its application effect

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## Abstract

with the continuous development of The Times, more and more demand for oil and gas resources in our country, in this development environment, need staff in the actual work, optimize the exploration technology, combined with the existing information technology, comprehensively deepen the work link, this can ensure that the exploration technology upgrade and optimization. Therefore, this paper mainly analyzes the unconventional oil and gas seismic exploration technology, and the application effect is discussed, hoping to provide some help and thinking to the staff.

## Keywords

Unconventional oil and gas; seismic exploration technology; application effect.

## 1. Foreword

Under the rapid development of social economy, the exploration technology has also changed to varying degrees under the development of The Times. Now, China is still in the basic development stage among some typical unconventional oil and gas exploration technologies. There are still some deficiencies and challenges in the traditional exploration technology, so the relevant personnel need to analyze it combined with the specific geological environment to realize the reform and innovation of oil and gas exploration technology.

## 2. The shortcomings of unconventional oil and gas seismic exploration technology

At present, in the unconventional oil and gas exploration technology, the mainly seismic geophysical technology is an important part of the unconventional oil and gas exploration, and it is also a relatively common technical means. Based on the reality, it can be found that China's existing oil and gas resources are relatively small, whether in the surface investigation or underground exploration activities, the geological conditions are relatively complex, which brings great difficulty to the personnel during the actual operation period. At present, China is still in the basic development stage in developing such unconventional oil and gas resources as coalbed methane and tight oil. Under this background, it can be seen that seismic exploration is facing many challenges and technical problems<sup>[1]</sup>. China's current unconventional oil and gas division environment has a certain complexity, in the specific exploitation, facing similar problems with conventional oil and gas, in the seismic mining technology, there are still some deficiencies. During the exploitation period, the burial depth of the oil and gas resources contained in the oil and gas resources changes relatively large. When storing the oil and gas resources, the local reservoirs can be found to be relatively weak, and the lateral change speed is also relatively fast, which puts forward different degrees of requirements for the seismic resolution technology and the static correction accuracy technology.

In addition, when carrying out unconventional oil and gas seismic survey activities, technicians need to analyze the natural environmental conditions of unconventional oil and gas. Generally,

the environment of such oil and gas is relatively special, and people are difficult to feel the resource content when affected by the external environment. The identification of oil and gas content through earthquakes has certain particularity, especially the geophysical response is more complex. In the meantime, there is some ambiguity, and the emergence of this phenomenon gives technicians a relatively high difficulty to analyze the reservoir dialectics and deep technology of seismic information. With the continuous promotion of economic construction activities, we can find that people's demand for resources is getting higher and higher. At present, unconventional oil and gas resources are relatively abundant and have not been extensively mined. The emergence of such oil and gas resources, both in terms of output and basic benefits, is somewhat lower than conventional oil and gas. When conducting the actual investigation activities, the technicians can find that the price undertaken is relatively low, which brings more challenges to people's application of technology. In the transformation of unconventional oil and gas reservoirs, large-capacity hydraulic fracturing is a relatively key technology. In this mode, technicians need to use supporting monitoring technology to optimize and monitor. However, this monitoring technology, still in a new field, cannot meet people's basic exploration needs.

### 3. Three-dimensional seismic exploration technology

#### (1) Scope of application and ideas

When exploring unconventional oil and gas technology in China, the domestic terrain environment is generally analyzed first. In the data investigation of Ordos Basin, it is found that the CBM and shale gas content are relatively abundant. Now this area has become the key area and demonstration site for development. In carrying out this technology, the staff need to use 3 D technology. The reason for choosing this technology is on the one hand, the terrain of this area is more complex, and the surface is a typical loess high terrain<sup>[2]</sup>. In this topographic environment, the content of oil and gas resources is relatively small, and in the actual mining activities, the underground structure is easy to be broken, which has more complexity. Where the oil and gas resources are buried, the depth changes are relatively large, and the thickness of the formation is too thin. If the personnel in the construction, using high precision exploration technology, often because of the high cost of this exploration technology.

This requires the staff to pay attention to the application of 3 D seismic exploration technology, which can be effectively combined with economic technology. Help the staff to effectively solve the relationship between technical needs or seismic survey costs, and can obtain more economic results. When the staff chooses this exploration technology, the staff mainly analyzes and investigates the local environment. After the comparison between the data, according to the concept of value engineering, combined with the seismic conditions in the current working area. Can be inside the region of unconventional oil and gas resources characteristics, in the analysis, according to the earthquake price, geological task and these factors, optimize the balance technical requirements and the relationship between the earthquake input, ensure the staff when receiving information, will achieve the advantages of full play, ensure various observation. Using the coverage times of this technology, the 3 D observation system can be designed and optimize the parameter system to further ensure the effective operation of the 3 D acquisition technology.

#### (2) Relevant technologies and application effects

Staff want to make full use of 3 d seismic exploration technology, need relevant personnel to analyze the technical content, the current 3 d seismic exploration acquisition technology, during the application, mainly contains the economic integration between 3 d observation system design, excitation parameter design and high precision gun inspection layout technology, using the wave equation forward or lighting analysis, and so on. When improving

the technical accuracy of medium and shallow imaging layer, technical personnel need to restrict the resolution and improve the technical processing effect. In the application of unconventional reservoir technology, fine seismic characterization technology is needed to achieve comprehensive evaluation and prediction. In the actual seismic exploration technology, the scientific application of different technologies can be realized by integrating 3 D seismic acquisition technology.

In addition, the application effect of this technology is mainly the technical personnel in China's 3 d seismic exploration technology has made a new breakthrough. The overall parameter data of unconventional oil and gas resources in Ordos Basin is analyzed, and the three-dimensional data experiment with high cost performance and high quality is realized<sup>[3]</sup>. During the specific utilization period, the data accuracy and reliability in the seismic interpretation results have also changed to varying degrees. This way is mainly based on this technology, Li Yongxia, which achieves different goals such as system characterization, weak layer prediction and detailed structural mapping. It provides a scientific theoretical basis for the future evaluation and well position selection of shale CBM. Through the comprehensive application of 3 D seismic exploration technology, the drilling efficiency and development efficiency can be effectively improved. Ensure that this technology can be applied and developed at different scales in the exploration and development of unconventional oil resources.

#### **4. Shale gas dessert area prediction technology**

##### **(1) Application scope and technical ideas**

Generally, in the shale gas structural conditions, it is necessary to find these conditions: suitable structural conditions; good reservoir conditions; can obtain high yield or maintain stable yield. This is also an effective area for the staff to design the level or realize the development of shale gas economy. This way is mainly based on earth information and develop the key technology of dessert area prediction, so as to ensure that the follow-up staff can achieve multi-directional development when supporting and guaranteeing the economic relationship of shale gas<sup>[4]</sup>. When thinking about these geological factors, such as shale gas, technicians can combine the physical correspondence of shale and geography as the main research basis to optimize the geophysical information feedback data. Through the analysis of information technology, combined with the three-dimensional seismic attributes, the drilling base, logging method and testing can be calibration and constrained, so as to ensure the accurate prediction and breakthrough and improvement of shale gas dessert technology.

##### **(2) Corresponding technology and research effect**

At present, key shale technologies contain more content, especially in specific tests, including physical testing technology in shale gas rocks, sensitive attribute data analysis, fine tectonic characterization and seismic pressure prediction, which continuously improves shale gas exploration technology and innovates. During the application period, this technology is usually analyzed with 3 D seismic data and results. In the analysis, the fusion of multi-attribute information is used to ensure that the prediction technology between shale gas deserts can make progress at different stages, and the prediction technology process of different attributes is established. In the current technical detection, whether TOC content or brittle prediction, or fracture prediction and other key technologies, now has a mature technical system. During the application, technicians can through multiple shale gas exploration and development area application and verification, this technology, both in prediction accuracy and credibility, have a certain trust between prediction results, in wellhead trajectory adjustment played a different role, technical personnel during use, need to analyze the research results, to ensure that shale gas in survey technology has a complete technical system.

## 5. Fracking microseismic monitoring technology

### (1) Application scope and method

The emergence of large-capacity hydraulic fracturing has become a widely used technology in unconventional oil and gas monitoring. The continuous use of this technology has also driven the development of fracturing microseismic monitoring technology, and become the main research object of people. Now this technology has attracted the attention and research of the relevant personnel. In recent years, the relevant personnel mainly carry out experiments through special research. At present, they have made varying degrees of progress in the fracturing microseismic detection equipment technology, supporting technology and the corresponding software. Technicians in the use of detection methods, and generally on different detection methods for experiments, combined with the specific environment for analysis, to ensure the correct use of methods<sup>[5]</sup>. Now the operation mode of fracturing microearthquake underground detection has become a relatively mature detection method, such as the ground monitoring method, due to the limitations of external resources, is still under exploration and improvement.

### (2) Corresponding technology and application effects

The emergence of this detection method, in terms of supporting technology mainly includes parameter argument, speed model correction and small fault and crack identification technology, etc., in the application effect can be found technicians established GeoEast-ESP software technology is mature, the technology began to be used in different exploration area, and has formed the scale of operation. Now this detection method has been continuously improved, and it has a very important technical basis in optimizing the fracturing parameters and reducing the fracturing cost.

These are the current use mode of unconventional oil and gas seismic exploration and exploration technology in China, each technology plays a different application effect, and has achieved the corresponding system. In practical application, it is also necessary to objectively understand the storage mode and geological conditions of unconventional oil and gas resources, and adhere to specific environmental analysis, so that different seismic technologies can be obtained through different experimental methods, which is also the link that relevant personnel need to pay attention to in their work.

## 6. The conclusion

From the above analysis, we can find that in order to utilize and develop unconventional oil and gas resources in various aspects, technicians need to pay attention to seismic exploration technology, strengthen technological innovation, and choose different exploration technologies by analyzing the geological environment of unconventional oil and gas resources. In addition, the staff also needs to constantly improve their own quality, analyze the application effect of each technology, understand the advantages and characteristics of each technology, so as to ensure that the staff during the practice, to ensure the orderly operation of the development activities.

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